User Manual

SPCS-2 Servo Pneumatic Proportional Control System

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SPCS Introduction

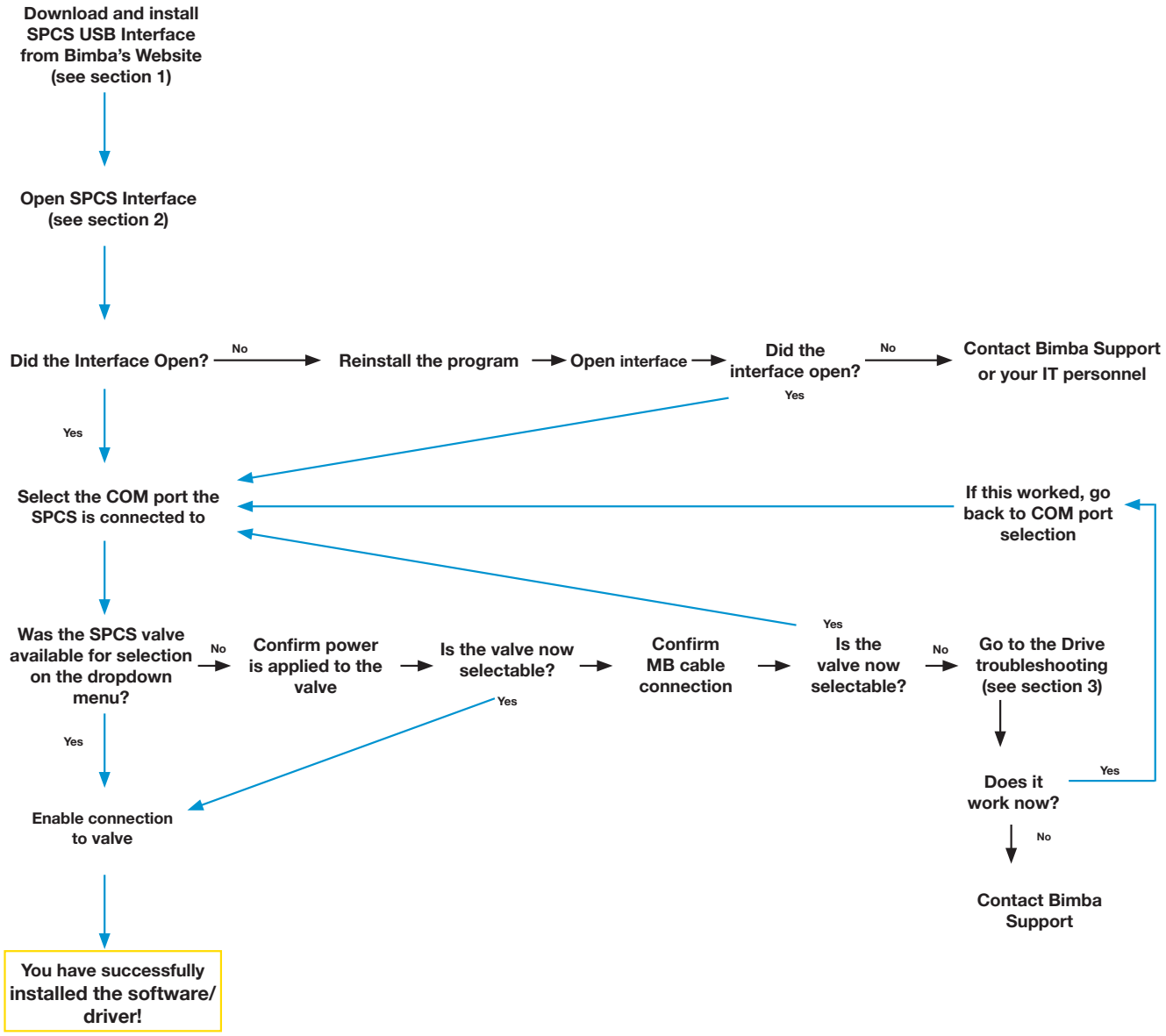
Introduction

The Servo Pneumatic Control System (SPCS) is a high flow pneumatic motion control valve that when combined with a position feedback actuator provides a “closed loop” positioning control system that quickly and accurately positions a payload.

System configuration and setup is completed by using a standard USB connection and Bimba’s SPCS software. The valve is IP65 compatible and can be used with both linear and rodless actuators with either an internal or external positioning transducer.

Software, System Connection and Setup

Flowchart outlining software download and establishing valve communications.

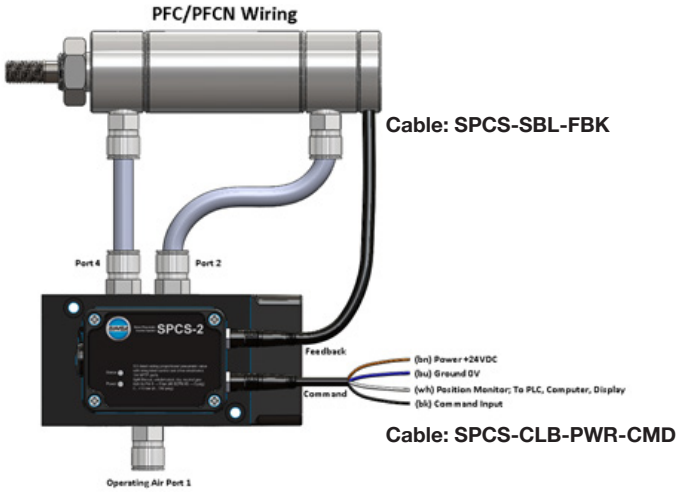

Download and install SPCS USB Interface from Bimba’s Website (see section 1)
Open SPCS Interface (see section 2)
Did the Interface Open?
No
Reinstall the program
Open interface
Did the interface open?
No
Contact Bimba Support or your IT personnel
Yes
Yes
Select the COM port the SPCS is connected to
If this worked, go back to COM port selection
Was the SPCS valve available for selection on the dropdown menu?
No
Confirm power is applied to the valve
Is the valve now selectable?
Yes
Confirm MB cable connection
Yes
Is the valve now selectable?
No
Go to the Drive troubleshooting (see section 3)
Yes
Does it work now?
Yes
No
Contact Bimba Support
Yes
Enable connection to valve
You have successfully installed the software/ driver!

1. Connecting to Valve

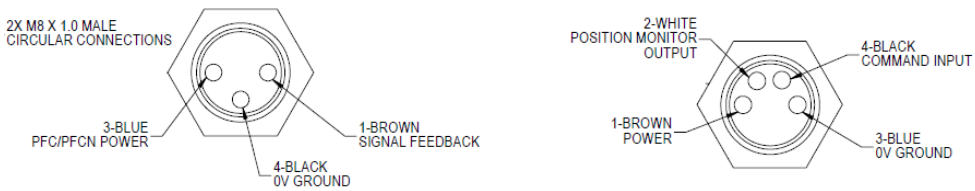
“With the air supply and power turned off”

1. Connect the SPCS-2 to the Bimba position feedback cylinder using cable SPCS-CBL-FBK.
2. If required, remove the top from the SPCS and configure internal jumper as shown in the illustration below.

3. Connect the SPCS-2 to your power and command sources using cable SPCS-CBL-PWR-CMD.
4. Connect Pneumatic Lines.
   a. Connect port 2 of the SPCS-2 to the back of the cylinder and port 4 to the front. (3/8” O.D. tubing – 10’ or less length is recommended to prevent performance loss)
   b. Inlet air should be dry (-40° F dew point) non-lubricated air, non-flammable & non-corrosive dry gases (0.3 micron fine grade coalescing filter with 5 micron pre-filter) at 0-150psig.
   c. Connect Inlet air to Port 1.



Power/Command & Feedback Connectors



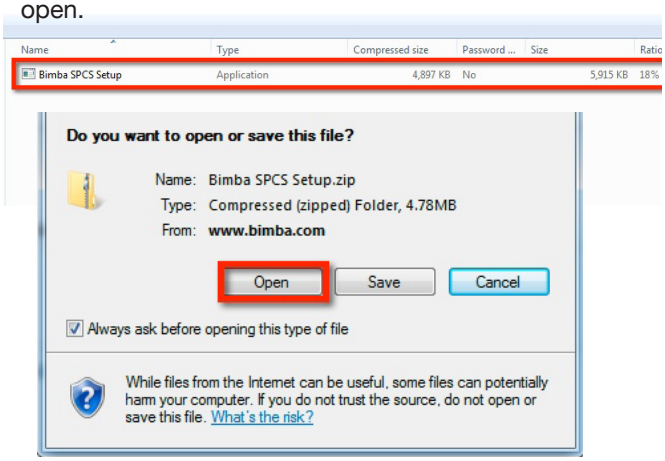
5. Connect the valve to your computer using USB cable SPCS2-USB-CBL.
6. Must use a coalescing filter.

1. Connecting to Valve

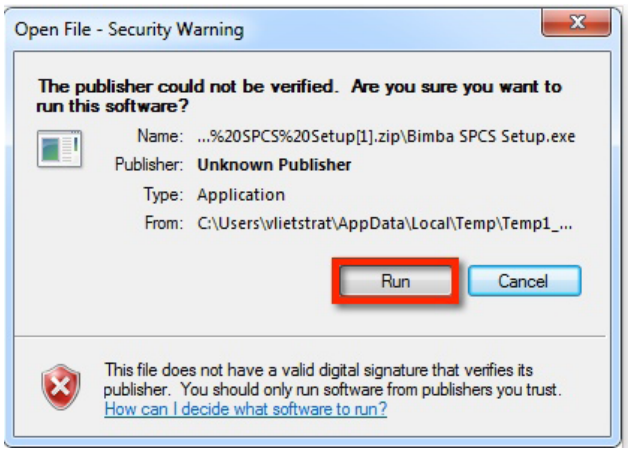
a. Download the SPCS USB software found on Bimba's website:

www.bimba.com/products-and-cad/actuators/inch/position-control/controllers11/servo-proportional-control-system/

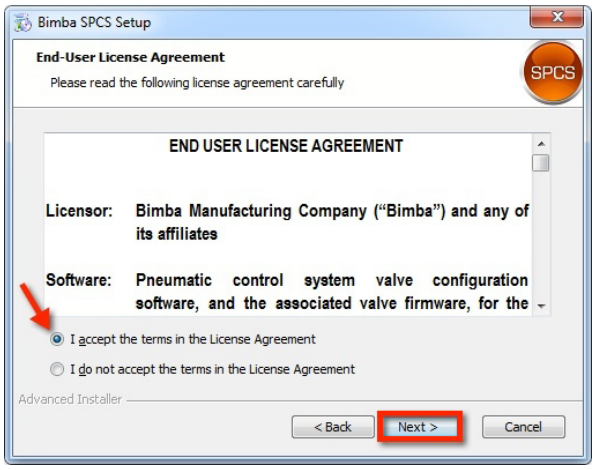
b. After the software package "Bimba SPCS Setup.zip" has downloaded, double click on the highlighted file, (usually the file can be found in the Download folder. Then click open.



c. Click the "Run" button.


Open File - Security Warning
The publisher could not be verified. Are you sure you want to run this software?
Name: ...%20SPCS%20Setup[1].zip\Bimba SPCS Setup.exe
Publisher: Unknown Publisher
Type: Application
From: C:\Users\vlietstrat\AppData\Local\Temp\Temp1_...
Run
Cancel
This file does not have a valid digital signature that verifies its publisher. You should only run software from publishers you trust.
How can I decide what software to run?

d. Click on the "I accept the terms in the License Agreement", then click on "Next >".

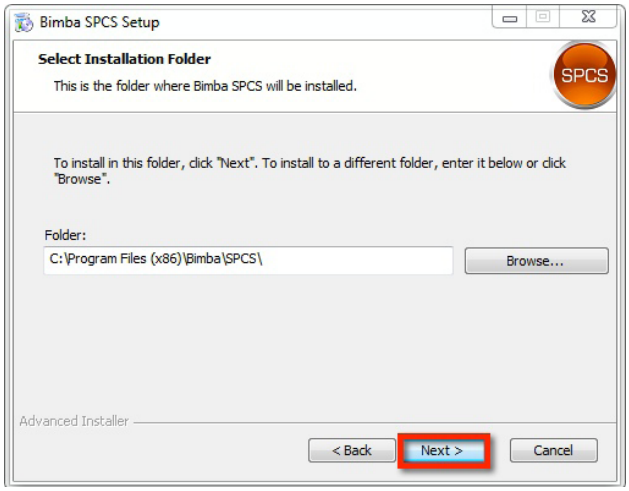

Bimba SPCS Setup
End-User License Agreement
Please read the following license agreement carefully
SPCS
END USER LICENSE AGREEMENT
Licensor: Bimba Manufacturing Company ("Bimba") and any of its affiliates
Software: Pneumatic control system valve configuration software, and the associated valve firmware, for the
I accept the terms in the License Agreement
I do not accept the terms in the License Agreement
Advanced Installer
< Back
Next >
Cancel

1. Connecting to Valve

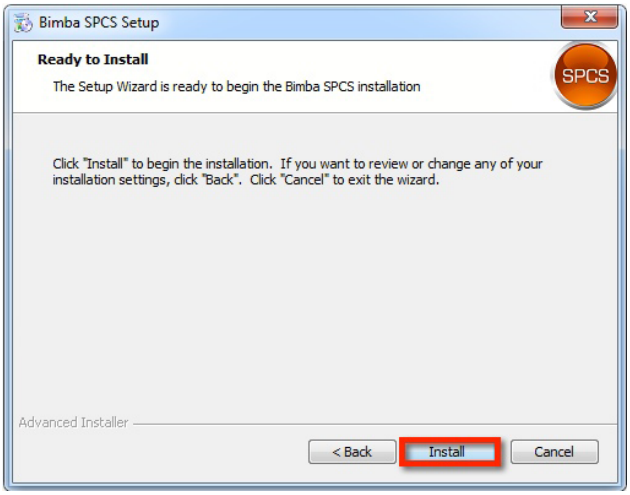
e. Click on the “Next >” button.

Bimba SPCS Setup
Welcome to the Bimba SPCS Setup Wizard
The Setup Wizard will install Bimba SPCS on your computer. Click "Next" to continue or "Cancel" to exit the Setup Wizard.
SPCS
< Back
Next >
Cancel

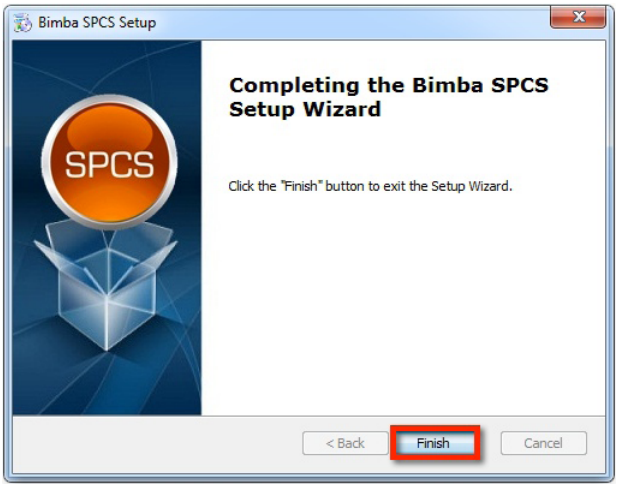
f. Click on the “Next >” button.


Bimba SPCS Setup
Select Installation Folder
This is the folder where Bimba SPCS will be installed.
SPCS
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".
Folder:
C:\Program Files (x86)\Bimba\SPCS\
Browse...
Advanced Installer
< Back
Next >
Cancel

g. Click the “Install” button.

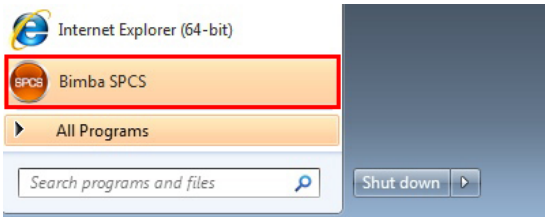

Bimba SPCS Setup
Ready to Install
The Setup Wizard is ready to begin the Bimba SPCS installation
SPCS
Click "Install" to begin the installation. If you want to review or change any of your installation settings, click "Back". Click "Cancel" to exit the wizard.
Advanced Installer
< Back
Install
Cancel

h. Click the “Finish” button.



2. Opening SPCS USB Interface

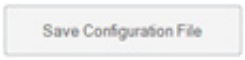
e. Click on the Bimba SPCS button in the Start Menu,.



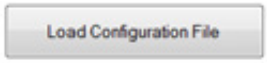
Initial Setup Screen

- Communication: Select the Select Port dropdown window: Select a Com Port and click the Enable Communication check box. If communication is established the remaining screen selections will become available. You may have several Com ports from which to choose – you may have to repeat the selection process above to find the correct one.

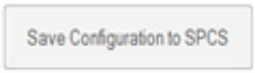
(All selections are "grayed out" until communication is established)

- Select Signals – Both command and feedback signals are selected by clicking the appropriate button – 0 to 10V is the default value.
- Enter cylinder bore size and rod diameter using the up or down arrows. (Rodless cylinders: set rod size at zero)
- Select Port Communication based upon your installation.
- After entry click 

The initial setup parameters, as well as those on the Basic Setup and Advanced Setup screens described below can be saved and reloaded for further adjustments or to program another valve. Upon clicking the "Save Configuration" button a window will appear that allows you to enter a file name and save it.

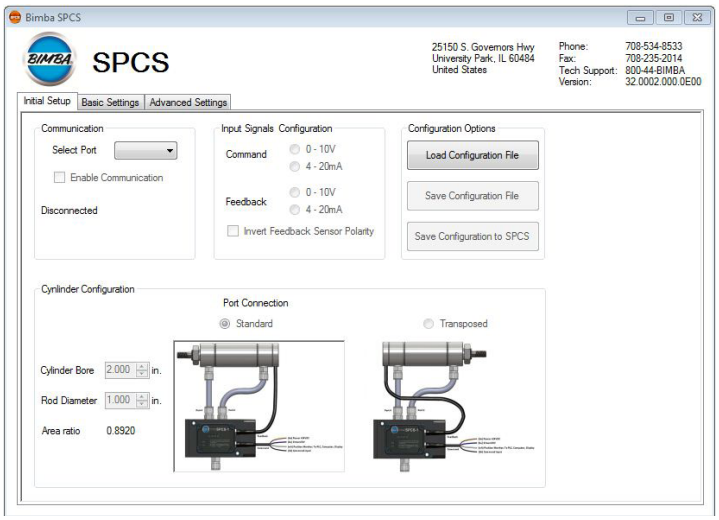


Click this button to load previously saved programs. A window will appear asking you to select and load a program.



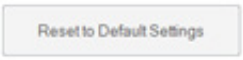
Click this button to save a new program or a program loaded from an existing file to the valve.

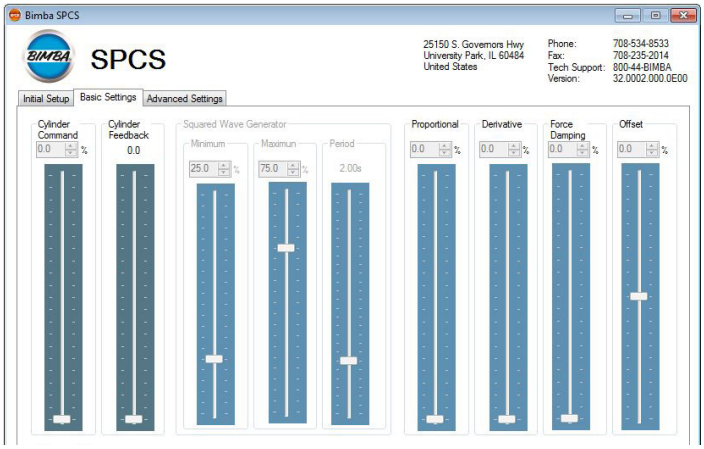
Note: Mouse over "Tool Tips" are provided for each selection.



3. Basic Settings

Proportional, Derivative, Force Damping, Offset -- At setup the default settings are set at zero. After adjustment, if necessary they can be reset to the default value by clicking:





Analog Button: Selection allows operation using an external signal source.

PC Slider Button: Selection allows operation by moving the Cylinder Command slider up and down, extending and retracting the cylinder.

PC Square Wave Button: Sends a square wave command signal based upon the gain perimeters described below, the minimum/maximum rod positions, ramp up/ramp down and period settings found on the Advance Setting screen. When selected the cylinder will operate using a square way generated by the software. You can adjust the gain, rod position and period perimeters during operation to further understand system responsiveness.

Gain Settings

Proportional

Increase or Decrease the cylinders responsiveness to changes in the command or feedback signal. Lower % slower responsive – Higher % quicker response. Note: If too high system becomes unstable. Suggested starting value 15% (Higher % needed for bore sizes 1-1/16" and below – Lower % needed for bore sizes above 1-1/16")

Derivative

Prevents Overshoot – Reduces overshoot and soothes system performance. Too high of a percentage gain can cause undershoot and creep into the target position as well as system instability. Suggested starting value 0.

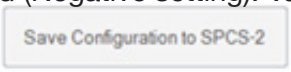
Force Damping

Increase or Decrease Force Damping – Increases system stability. Lower % less force damping – Higher % more force damping. Too little force damping can create an oscillating rod condition. Too much force damping can result in a nonresponsive system. Suggested starting value 15%.

Offset

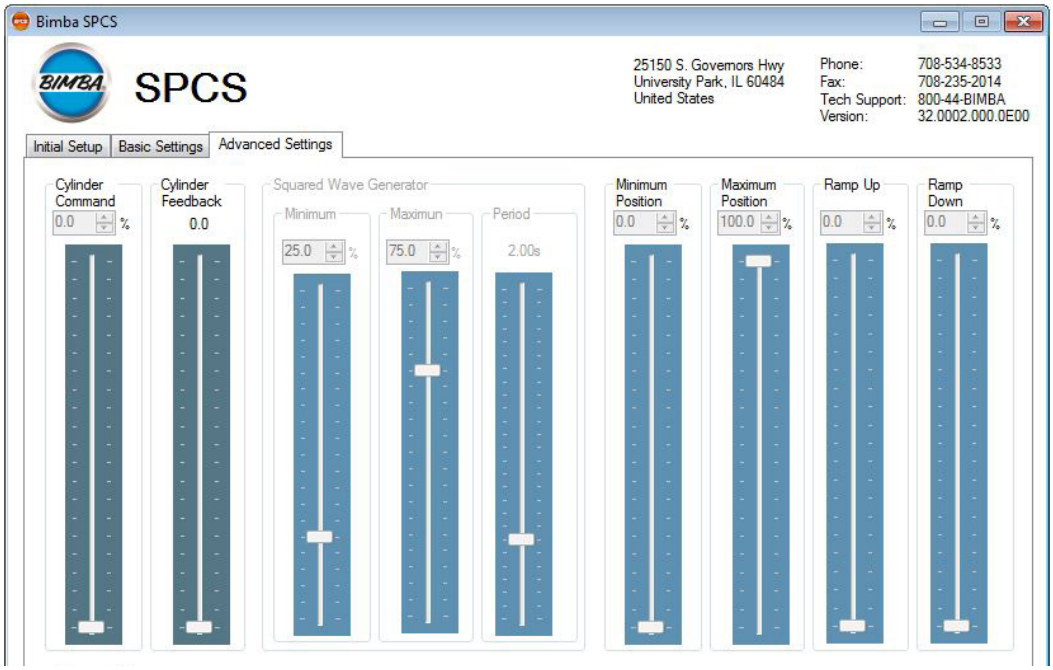
Offset - Offset is used when the cylinder is mounted vertically to create symmetrical or balanced motion. If the cylinder is facing "rod up", the offset should be increased. When a cylinder is facing down the offset should be decreased (Negative setting). Value should be set to 0 for horizontal applications

Save your settings:



Oscillations: If the rod begins a rapid oscillation the Proportional or Force Damping % requires adjustment. To correct this either decrease the Proporational gain or increase Force Damping

3. Advance Settings



Determine the electrical offset % between the Cylinder command signal and the Cylinder feedback signal

- Minimum Position Slide: Move the slide to zero
- Maximum Position Slide: Move the slide to 100%
- Cylinder Command Slide: Move the slide to zero (the cylinder should fully retract) – note the percentage at the top of the Cylinder Feedback Slide. The percentage shown is the offset that should be adjusted for in setting your command signal to retract the cylinder to a specific position.
- Repeat this process with the cylinder fully extended (Move the Cylinder Command to 100%) Note the % difference between the Cylinder Command and the Cylinder Feedback percentages. Use this to compensate for extending the cylinder to a specific position along the rod length.

(You may need to add the % offset to the required position when using rod positions other than fully extend and retract)

Period – This sets the time it takes to complete a full cycle.

Minimum Position – Retract; Zero equals full retract; Higher % sets rod retract before full mechanical retract – Ex. 5” rod, set at 35% - rod retract stopping point equals 1.75”. Prevents piston bottoming out at full retract.

Maximum Position – Extend; 100% is fully extended. Lower % set maximum extend at less than mechanical full extend – Ex. 5” rod, set at 85% - full rod extension 4.25”. Prevents piston striking the rod guide at full extend.

Ramp Up – Increases or decreases extend speed. Higher % reduces speed; Lower % increases speed.

Ramp Down – Increases or decreases retract speed. Higher % reduces speed; Lower % increases speed.

When PC Square Wave is selected and the system is operating you can change the perimeters to further adjust the valve and cylinder responsiveness.

3. Linear & Rotary Cylinder Load Vs. Velocity

Maximum Moving Mass

The tables below recommend the maximum moving mass controlled by a SPCS-2 for horizontal and vertical applications. Information for Bimba's PFC, Pneu Turn and Ultran magnetically coupled cylinders is included. Actual mass will vary based on cylinder speed and mechanical assembly (e.g. friction in cylinder or system, air pressure, etc.)

Linear Cylinder
Horizontal Applications

Bore Size	Average Velocity Without Overshoot @ Max Payload [in/sec]	Maximum Payload [lbs.]	Average Velocity @ 50% Max Payload [in/sec]	Average Velocity @ 25% Max Payload [in/sec]
09	20	50	20	30
17	10	100	20	30
31	15	200	20	30
50	15	315	25	30
70	15	450	20	20

Linear Cylinder
Vertical Applications

Bore Size	Average Velocity Without Overshoot @ Max Payload [in/sec]	Maximum Payload [lbs.]	Average Velocity @ 50% Max Payload [in/sec]	Average Velocity @ 25% Max Payload [in/sec]
09	70	5	100	100
17	70	10	60	60
31	50	30	40	60
50	15	95	30	30
70	20	135	20	20

Rotary Actuator

Rack and Pinion - Single Rack			
Bore Size	**Rotation**	**Average Velocity**	**Max Torque**
1-1/2"	0 to 360°	150° per second	30 in/lb.
2"	0 to 360°	150° per second	84 in/lb.

Rack and Pinion - Double Rack			
Bore Size	**Rotation**	**Average Velocity**	**Max Torque**
1-1/2"	0 to 360°	150° per second	60 in/lb.
2"	0 to 360°	150° per second	144 in/lb.

3. Rodless Cylinder Load Vs. Velocity

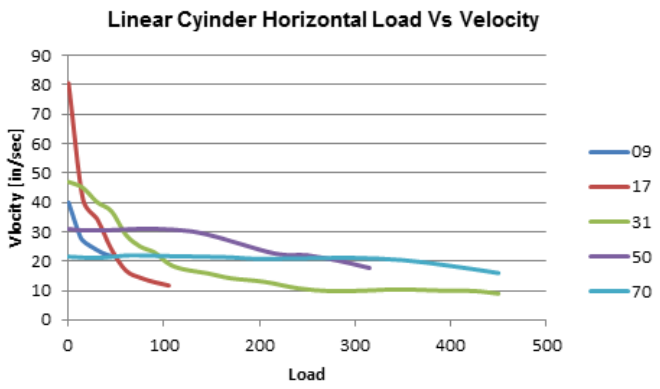
Rodless Cylinder
Horizontal Applications

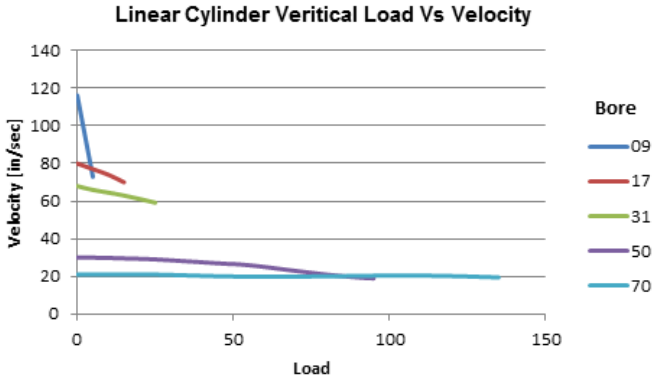
Bore Size	Average Velocity Without Overshoot @ Maximum Payload [in/sec]	Maximum Payload [lbs.]	Average Velocity @ 50% Maximum Payload [in/sec]	Average Velocity @ 25% Maximum Payload [in/sec]
USS-09X-L	6	84	16	27
UGS-09X-L	10	104	20	36
USS-17X-L	8	260	22	27
UGS-17X-L	7	260	21	30

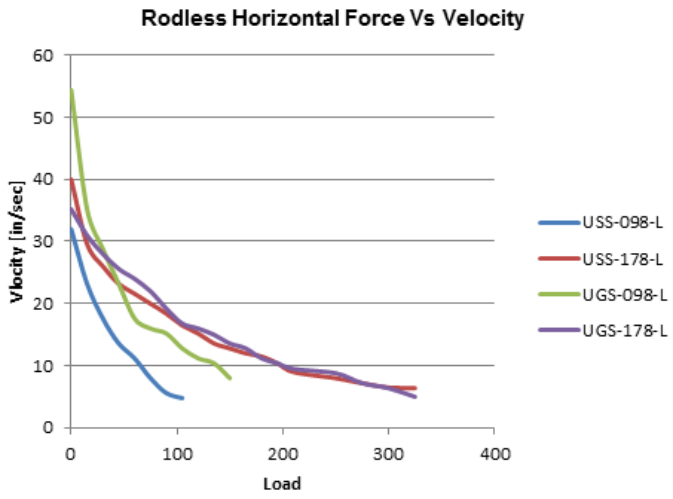
Rodless
Vertical Applications

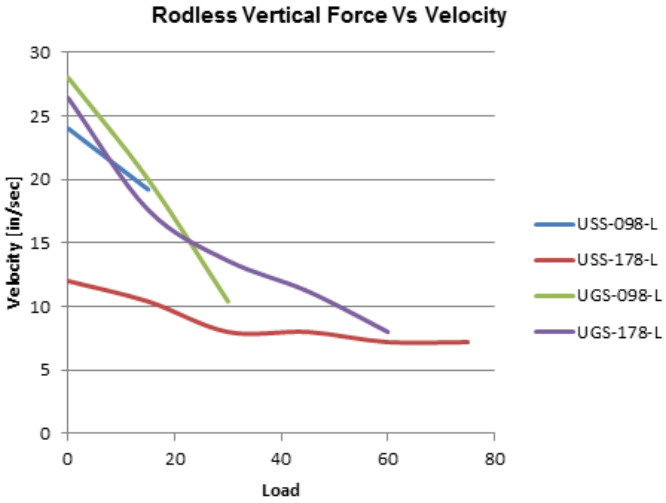
Bore Size	Average Velocity Without Overshoot @ Maximum Payload [in/sec]	Maximum Payload [lbs.]	Average Velocity @ 50% Maximum Payload [in/sec]	Average Velocity @ 25% Maximum Payload [in/sec]
USS-09X-L	24	12	26	28
UGS-09X-L	13	24	25	30
USS-17X-L	9	60	10	13
UGS-17X-L	10	48	17	22

3. Cylinder Performance Graphs









3. Troubleshooting Chart

Symptom	Probable Causes	Corrective Action
System Totally Unresponsive	Power not Applied	Apply power, check all power wiring
	Air Off	Turn air on
	Proportional Gain too Low	Basic Settings – Increase Proportional Gain
	Inverted Sensor Polarity	Initial Setup – Click the “Invert Feedback Sensor Polarity” checkbox
	Pneumatic Connections to Cylinder are Backwards	Initial Setup – Click the “Transposed” button under Port Connection
System Mildly Responsive or Sluggish	Proportional Gain too Low	Basic Settings – Increase Proportional Gain
	Force Damping Gain too High	Basic Settings - Decrease Force Damping
	Power Supply Voltage not Stable	Check power wiring; change power supply
	Cylinder too Small	Decrease moving mass, increase cylinder size, or increase inlet pressure.
System Freezes Fully Extended or Retracted	No Feedback Signal	Connect Feedback Signal
	Feedback Connected Improperly	Verify all wiring is as shown in application examples and as described in the “System Setup” section of this document
	Cylinder Connected Improperly	Verify airline connections
System Fails to Operate or is Inaccurate	Incorrect Wiring	Verify all wiring is as shown in the System Setup section of this document
	Mechanical System	Insure mechanical system is free from binding and high friction.
	Proportional Gain too Low	Basic Settings – Increase Proportional Gain
	Force Damping Gain too high	Basic Settings - Decrease Force Damping
	Offset Gain Adjusted incorrectly	Basic Settings - Adjust Offset
	Incorrect Cylidner Bore or Rod Diameter Entered	Initial Setup - Check Cylidner Bore and Rod Size
	Air Leaks	Insure there are no air leaks in the system
	SPCS-2 Sticking	Insure that inlet air meets valve specifications. See “System Setup” – Contact Bimba
System Oscillates	Force Damping too Low	Basic Settings - Increase Force Damping
	Proportional Gain too High	Basic Settings - Decrease Proportional Gain
System Overshoots	Proportional Gain too High	Basic Settings - Decrease Prportional Gain
System ‘Buzzes’	Input Signal Noise (possibly 60Hz)	Verify that large or high power machinery is not operating nearby. Also, verify input signal integrity by examining the signal with an oscilloscope.
	Input Signals not connected	Verify all wiring as shown in the “System Setup” section of this document
	DC Common not connected	Verify all DC common connections

3. Technical Data

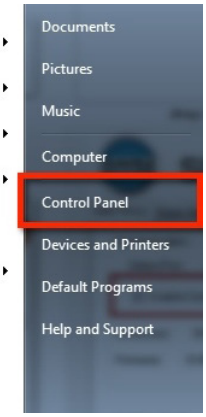
Mechanical Specifications
Pressure: 0 – 150 psig (0 – 10 bar) Un-lubricated, Dry, Neutral Gas
Ports: 1/4” NPT
Connector: 4-pin M8 x 1 (male) and 3-pin M8 x1 (male)
Mounting: 2 x 10-32 thru Holes
Temperature Range: 32°F- 104°F (0°C - 40°C)
Filtration: 5 µm particulate
0.3µm coalescing
Weight: 2.0Lbs. (0.91 kg)
Body: Aluminum 6061
Performance
Position Accuracy: +- 1% of full stroke
Repeatability: 3mV
Flow: 46 SCFM @ 80 psig (820 SLPM @ 6 bar)
Leak Rate: 12 SCFH @ 150 psig (5.7 SLPM @ 10 bar)
Electrical Specifications
Power: 24 VDC nominal @ 20W
Command Input Impedance: 100kΩ
Feedback Input Impedance: 100kΩ
Command Input: Configurable 0…10 VDC; 4…20mA
Feedback Input: Configurable 0…10 VDC; 4…20mA
Excitation: +10V (15mA max)

4. Appendix - Auto Com Port Detection

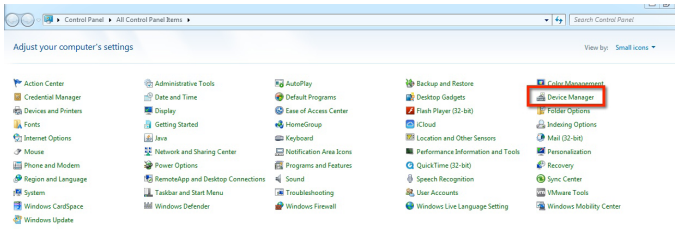
Step 1: How to Install/Detect the SPCS Communication Drives

a. Click the Start Menu.

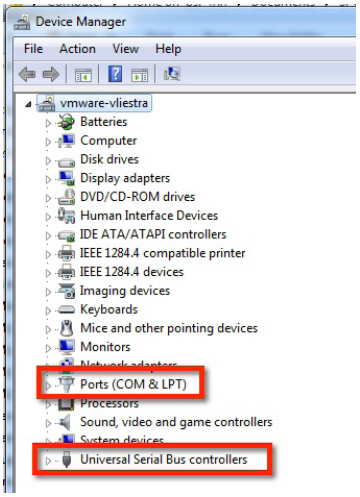
b. Then click “Control Panel”.



c. Double Click on the “Device Manager”.

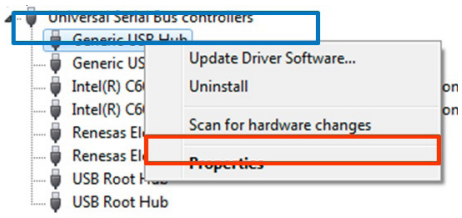


d. This will open the Device Manager Window. (The SPCS drivers are located under Ports (COM & LPT) or Universal Serial Bus controllers.



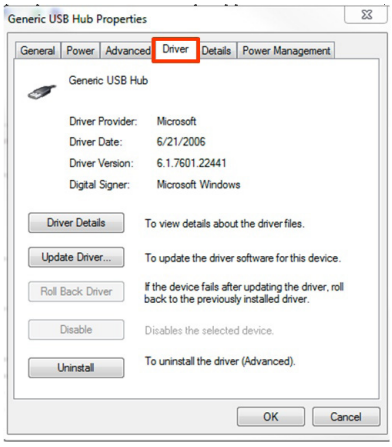
e. To detect any issues, look for devices in the Device Manager that have an icon similar to the following (USB with yellow exclamation mark signifying that the driver is not recogonized). If no issues are detected, please continue to Step 2.

f. Once the faulity driver has been identified, right click on the driver (shown in blue) then left click on “Properties”.

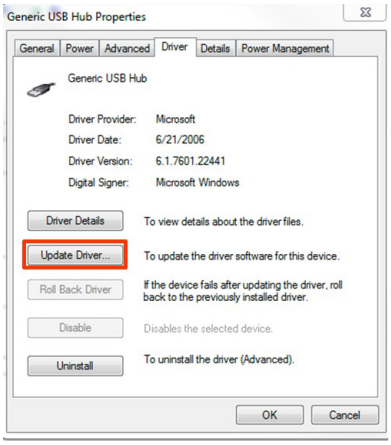


4. Appendix - Auto Com Port Detection

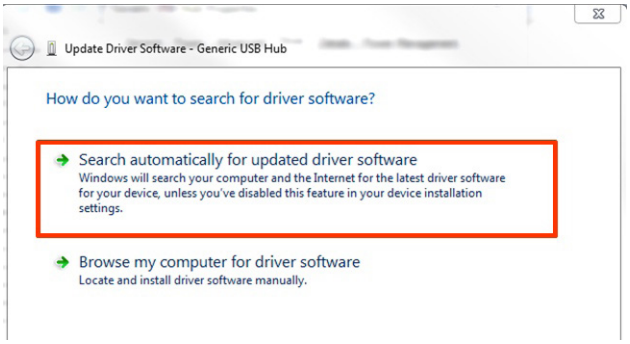
g. Next, select on the Driver tab (the following image is for example purposes only, your driver properties menu may appear differently).



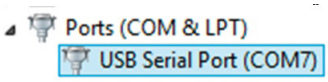
h. Click on “Update Driver”.



i. A new window will open. Click “Search automatically for updated driver software” (to enable to search online {where the drivers are typically found}, establish an interent connection prior to searching).


Update Driver Software - Generic USB Hub
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.

j. After the process is complete, the device under the Ports section on the Device Manager window should be visible and free of errors. If not, continue onto Step 2. In this case, Port 7 is the connection to the SPCS.

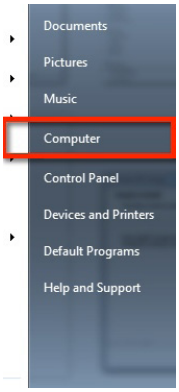


4. Appendix - Auto Com Port Detection

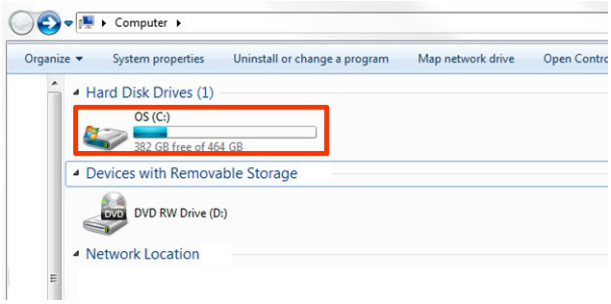
Step 2: How to Install/Detect the SPCS Communication Drives (continued)

a. Click the Start Menu.

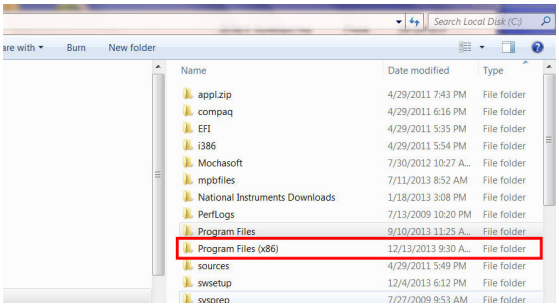
b. Click on “Computer”.



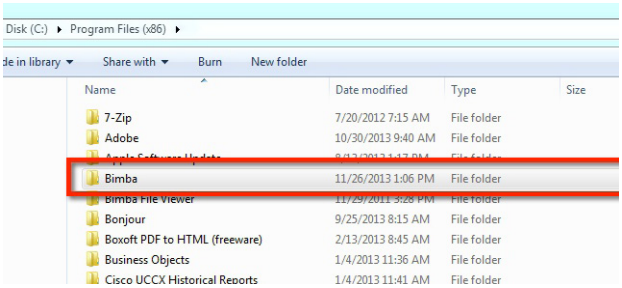
c. Double click on the hard drive icon (usually C: or D:).



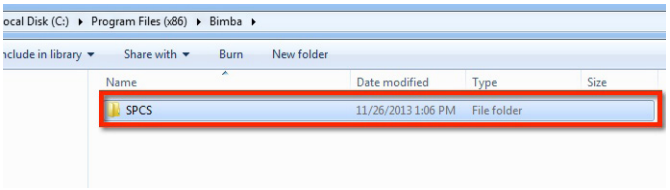
d. Double click on “Program Files (x86).



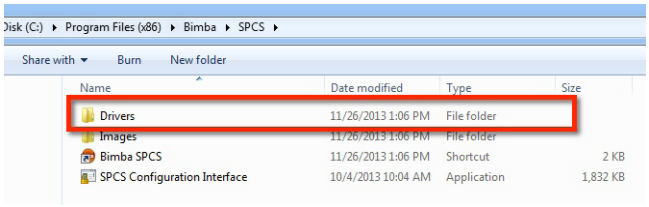
e. Double click on the “Bimba Folder”.



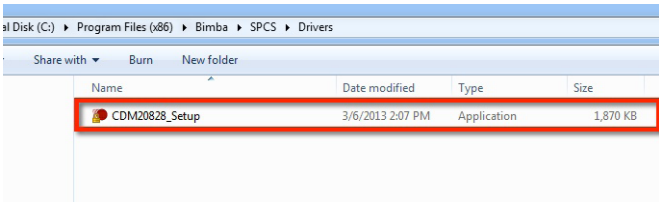
f. Double click on the “SPCS Folder”.



g. Double click on the “Driver Folder”.

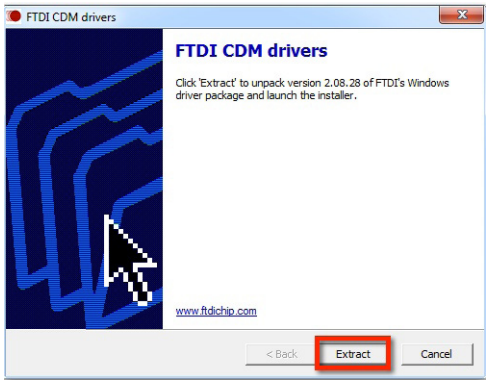


h. Double click on the “CDM20828_Setup” application.

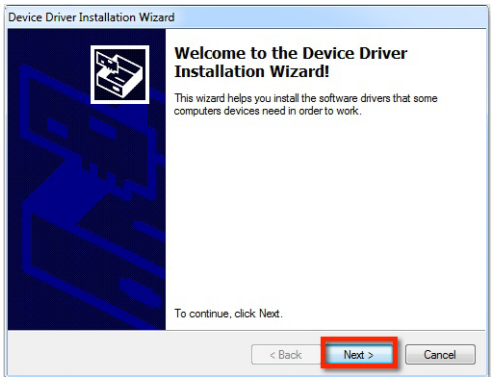


4. Appendix - Auto Com Port Detection

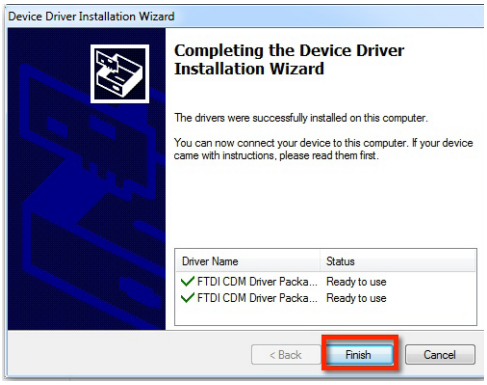
i. Extract the files by clicking on the “Extract” button.



j. Click the “Next >” button.


Device Driver Installation Wizard
Welcome to the Device Driver Installation Wizard!
This wizard helps you install the software drivers that some computers devices need in order to work.
To continue, click Next.
< Back
Next >
Cancel

k. Click “Finish” as the driver has now successfully installed itself.


Device Driver Installation Wizard
Completing the Device Driver Installation Wizard
The drivers were successfully installed on this computer.
You can now connect your device to this computer. If your device came with instructions, please read them first.
Driver Name
Status
FTDI CDM Driver Packa...
Ready to use
FTDI CDM Driver Packa...
Ready to use
< Back
Finish
Cancel

Go back to section 2: Opening SPCS Interface and restart the process of finding the COM Port.
If you still cannot locate the communicate the COM port, please contact the Bimba Manufacturing support team.

Preface

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